

Appl. No.: 09/973,287

Filed: October 5, 2001

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please amend Claims 1, 2 and 3, and add Claim 5 as follows:

1. (CURRENTLY AMENDED) A reformer for a mixture of low-pressure hydrocarbon gas and steam for fueling a proton-exchange membrane fuel cell with purified hydrogen from said mixture, comprising
a cylinder loosely packed with a palletized catalyst with a cap at each end,
a fuel tube having an outflow end coupled to said cylinder for introducing said hydrocarbon gas into one end of said cylinder at low pressure ~~having an outflow end coupled to said cylinder through a cap at one end of said cylinder,~~
a steam tube coaxial with ~~said fuel tube and surrounding~~ said fuel tube for concurrently introducing said hydrocarbon gas and steam at a pressure higher than ~~said low the pressure of said~~ hydrocarbon gas ~~through said cap~~ at said one end of said cylinder, said steam tube having a tip ~~of finite length~~ at its outflow end that is gradually reduced in diameter over its length to form a truncated conical tip, ~~with its said fuel tube having a substantially open end coincident with, of smaller diameter than~~ said steam tube diameter forming an outflow end for said fuel tube, and
an outflow tube protruding outwardly from said cylinder ~~through an end cap at an end of said cylinder opposite said one end,~~
~~wherein said steam tube extends being formed and to said outflow end of said fuel tube not only for flowing steam to draw out said low pressure hydrocarbon gas for mixing into mixture with said steam, but also flows and to direct said steam through a core of said fuel outflow in a direction path that is at~~

an acute angle with the direction path of said fuel outflow core, which is said fuel flow path lying substantially along the axis of said coaxial fuel and steam tubes, thereby causing to cause steam to and that crosses said fuel outflow path at an acute angle from all radial directions,

~~— whereby said hydrocarbon gas and steam mix before coming in contact with said loosely packed palletized catalyst as steam and fuel mixture flows over said catalyst through said cylinder to produce a high yield of H₂, as said hydrocarbon gas is converted into a flow of H₂, CO and CO₂ through said outflow tube of said cylinder.~~

2. (CURRENTLY AMENDED) A hydrocarbon gas and steam reformer as defined in claim 1 wherein said fuel tube has a tip of finite given length at its outflow end that is reduced in diameter gradually along said finite given length.

3. (CURRENTLY AMENDED) A hydrocarbon gas and steam reformer as defined in claim 1 where said hydrocarbon gas is low pressure propane, stored as liquefied liquefied propane in a container ~~for safe use~~ on aboard recreational vehicles.

5. (NEW) A method for mixing low pressure hydrocarbon gas with steam for fueling a proton-exchange membrane fuel cell with purified hydrogen from said mixture comprising: mixing low pressure hydrocarbon gas with steam at a pressure higher than said low pressure hydrocarbon gas, said mixing taking place at the outlet ends of two concentric tubes, wherein said mixing includes directing steam into said hydrocarbon gas at an acute angle to the path of said hydrocarbon gas flow on a plurality of radial paths.

REMARKS

Applicant here amends independent Claim 1 to distinguish clearly the fuel-cell system of the cited *Fischer, et al.*, U.S. Patent No. 3718506 ("the *Fischer* patent"). The *Fischer* patent does not include concentric steam and fuel tubes for concurrently introducing hydrocarbon gas at low pressure and steam at a pressure higher than the pressure of the hydrocarbon gas into a catalytic chamber for forming hydrogen. As a result, there is no need for a pump to deliver low-pressure gas, or for heating the hydrocarbon gas source. Nor does the *Fischer* patent disclose such tubes for mixing high pressure steam and low-pressure hydrocarbon fuel that cause the steam to flow into the core of the fuel such that steam crosses the fuel flow at an acute angle from all radial directions. Instead, the *Fischer* patent discloses a device for mixing unreacted flammable gases with fuel gases, and does not disclose mixing steam with hydrocarbon fuel at all.

Applicant's counsel would welcome an opportunity to discuss any issue, at any time with the PTO.

Dated: September 19, 2005

Respectfully submitted,



Patrick F. Bright
BRIGHT & LORIG, P.C.
633 W. 5th Street, Suite 3330
Los Angeles, CA 90071

Tel.: (213) 627-7774
Fax: (213) 627-8508
Atty. Reg. No. 24,318